

REMARKS

Claims 1, 2, 4-10 and 12-24, are all the claims pending in the application. Claims 1, 2, 4, 5, 7-10 and 12-24 are rejected. Claim 6 is objected to. Claims 1, 2, 7, 8, 12 and 13 are amended. Claims 22-24 are cancelled. Thus, claims 1, 2, 4-10 and 12-21 remain pending.

Support for Amendments

In amended claims 1 and 2, “an EUV (extreme ultra violet) mask blank” is based on the descriptions of page 6, lines 1-3 from the bottom and page 22, lines 4-5 of the original specification.

In amended claims 1 and 2, “a preparing step of preparing the glass substrate having a surface subjected to precision polishing” is based on the description of page 8, lines 5-6 of the original specification.

In amended claim 1, “an acid treatment step of subjecting, after the flatness control step, the surface of the glass substrate to acid treatment under a condition that machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining and left on the surface of the glass substrate are removed while maintaining the flatness and a surface roughness of the glass substrate;” is based on the descriptions of page 18, line 1-3 and page 18, line 8-11 of the original specification and on the description of page 5, lines 12-15 of the original specification.

In amended claim 2, “an alkali treatment step of subjecting, after the flatness control step, the surface of the glass substrate to alkali treatment under a condition that machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining and left on the surface of the glass substrate are removed while maintaining the flatness and a surface roughness of the glass substrate;” is based on the description of page 27, lines 1-3 of the original specification and on the description of page 5, lines 7-15 of the original specification.

In amended claims 7 and 12, “the reference value is not greater than $0.5 \pm 0.05 \mu\text{m}$ ” is based on the descriptions of page 6, lines 1-3 from the bottom and page 22, lines 4-5 of the original specification.

Claim Objections

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicants greatly appreciate the Examiner's indication of allowability, but have chosen to better define the overall sequence of steps that comprise the invention, as set forth in amended claims 1 and 2.

Claim Rejections – 35 U.S.C. § 112

Claims 8-10, and 13-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite. This rejection is traversed for at least the following reasons.

The Examiner notes that claim 8 depends upon cancelled claim 3 and that claim 13 depends upon cancelled claim 11. The dependency of the rejected claims has been corrected.

Claim Rejections – 35 U.S.C. § 103

Claims 1-2, 4-5, 7-10, and 12-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied in paragraph 4 of the previous office action. This rejection is traversed for at least the following reasons.

First, as to claims 22-24, the rejection is moot in view of the cancellation of the claims.

Second, as to the previous rejection, the Examiner stated the rejection in the Office Action dated June 27, 2008 as follows:

Claims 1-5, and 7-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cardinale (6,015,640) further in view of Hata et. al. (JP 63-114,866) and Takeuchi et. al. (2002/0179576).

This rejection is traversed for at least the following reasons.

Claims 1 and 2

Claims 1 and 2 are independent claims that differ at least in reciting use of an acid treatment step (claim 1) and an alkali treatment step (claim 2) but otherwise recite similar steps and have similar goals. Each has been amended to further define the invention with respect to

the local machining and the acid or alkali treatment step. The claims as now amended are distinguishable over the prior art, taken alone or in combination, as detailed subsequently.

Takeuchi

In responding to Applicant's arguments, the Examiner only specifically addresses the comments made with regard to the Takeuchi reference. Since this reference is perceived to add a key component to the Examiner's rejection on the basis of the combined teachings of the prior art, Takeuchi will be discussed first. Specifically, the Examiner points out on page 3, line 3 from the bottom through page 4, line 2 of the Final Office Action that:

"in section 0016 of Takeuchi et al (2002/0179576), they specifically mention the need to remove the damaged region of a glass substrate, which has been plasma etched to flatten it, using some type of polishing process. Thus, there is a suggestion to remove the damaged region of the plasma etched surface of the glass substrate using some type etching process (i.e. polishing) contrary to what applicant purports." (emphasis added)

Takeuchi's Polishing Does Not Correspond to the Claimed Step

The Examiner has argued at page 3 that the Applicant is attacking the references individually and that the references, when combined, teach the specific features of the claim. Applicants submit, however, that the teachings in separate references must be of the same step in the same order for the same purpose. A polishing step for one purpose (e.g., rough polishing) is not relevant to a polishing step for another purpose (e.g., finish polishing). Thus, the missing step in a primary reference must be taught for the same purpose in a secondary reference. The addition of such step to a process taught by a primary reference may be inventive in that it solves a unique problem that has arisen in the process taught by the primary reference, and would not otherwise have been considered by one skilled in the art to have solved such problem in that process.

Specifically, in the present case, the polishing process of Takeuchi et al does not correspond to a treatment after either of an acid treatment step (amended claim 1) or an alkali

treatment step (amended claim 2), each of the acid or alkali treatment steps occurring after a flatness control step.

Takeuchi's Polishing is Not After Acid or Alkali Treatment

Takeuchi et al never discloses “an acid treatment step of subjecting, after the flatness control step, the surface of the glass substrate to acid treatment under a condition that machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining and left on the surface of the glass substrate are removed while maintaining the flatness and a surface roughness of the glass substrate”, as expressly required in amended claim 1. Takeuchi et al also never discloses “an alkali treatment step of subjecting, after the flatness control step, the surface of the glass substrate to alkali treatment under a condition that machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining and left on the surface of the glass substrate are removed while maintaining the flatness and a surface roughness of the glass substrate”, as expressly required in amended claim 2.

Takeuchi Was Considered In Applicants' Background

Takeuchi et al (2002/0179576), cited by the Examiner in the Final Office Action, correspond to the “Japanese Patent Application Publication (JP-A) No. 2002-316835 (Reference 2)” described on page 2, lines 5-6 from the bottom of the original specification. As to the relevance of Takeuchi, Applicants commented on page 3, lines 4-9 of the original specification that:

“In case where the flatness of the surface of the glass substrate is adjusted by the local machining using the plasma etching or the gas cluster ion beam, a roughened surface or a machining-affected layer (a damaged layer) is formed on the glass substrate after the local machining. Therefore, it is necessary to perform polishing for a short time after the local machining in order to repair the roughened surface or to remove the machining-affected layer.”

This description on page 3, lines 4-9 of the original specification is based on the description of the above-referred section 0016 of Takeuchi et al (2002/0179576).

However, Takeuchi et al (2002/0179576) never disclose the new problem that was identified by the Applicants, namely:

“if polishing is performed in the state where machining scraps of the glass substrate or a reaction product produced by local machining are left on the surface of the glass substrate, microscopic defects having a depth on the order of several nanometers to several tens nanometers are caused on the surface of the glass substrate. As a result, it is impossible to obtain the glass substrate having a surface roughness Ra of 0.2 nm or less.”, as described on page 3, lines 10-15 of the original specification.

Takeuchi Does Not Consider the New Problem

The present invention seeks to solve the new problem and has features described in amended claims 1 and 2 that successfully address that problem. As mentioned above, Takeuchi et al never disclose “an acid treatment step of subjecting, after the flatness control step, the surface of the glass substrate to acid treatment under a condition that machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining and left on the surface of the glass substrate are removed while maintaining the flatness and a surface roughness of the glass substrate”, as described in amended claim 1. Takeuchi et al also never disclose “an alkali treatment step of subjecting, after the flatness control step, the surface of the glass substrate to alkali treatment under a condition that machining scraps of the glass substrate, a reaction product, and a machining-affected layer produced by the local machining and left on the surface of the glass substrate are removed while maintaining the flatness and a surface roughness of the glass substrate”, as described in amended claim 2.

No Teaching of Added Preparing Step

In addition, Takeuchi et al never discloses “a preparing step of preparing the glass substrate having a surface subjected to precision polishing”, as described in amended claims 1 and 2. The preparing step is carried out before the profile measuring step, the flatness control step, the acid treatment step (or the alkali treatment step, and the polishing step.

Takeuchi Fails to Teach Three Key Steps

In sum, from the foregoing, it is clear that Takeuchi does not teach any of an initial preparing step, or a subsequent acid or alkali treatment step followed by a polishing step immediately after such acid or alkali treatment step.

Cardinale

Cardinale, which is the primary reference cited in the previous office action, never discloses any one of the preparing step, the profile measuring step, the flatness control step, the acid treatment step or the alkali treatment step, or the polishing step, in that order as expressly set forth in amended claims 1 or 2.

Cardinale only discloses the basic structure of the EUV mask blank and a process of producing the EUV mask blank. Cardinale neither discloses nor suggests anything with respect to the technical feature of the present invention, namely, the specific kind of process that is used in order to obtain the glass substrate for an EUV mask blank.

Cardinale Fails to Teach Five Key Steps

In sum, from the foregoing, it is clear that Cardinale has only generic teachings and provides no specific teaching or suggestion with respect to the individual steps or the combination of steps in sequence that leads to the EUV mask blank, as claimed.

Hata

Hata et al (JP 63-114866) only discloses that the surface of a glass workpiece, having been ground with the use of abrasive particles, is subjected to optical etching treatment using an acid etching liquid or an alkali etching liquid, in order to remove a process deformed layer on the surface of the workpiece by about 50 to 500 μm . Then, the substrate of the glass workpiece thus subjected to the etching treatment, is polished (Abstract).

Hata's Process Does Not Achieve the Claimed Flatness and Roughness

According to the description of in the Hata et al specification on page 458, right lower column, lines 15-18, by carrying out the polishing process during a period of 30 minutes to 100 hours, it is possible to obtain the polished glass having a surface roughness of 5 Angstroms to 30

Angstroms. However, this is conducted in a manner similar to the conventional precision polishing.

That is, Hata et al disclose that, after the grinding process, the process-deformed layer that occurs in the grinding process will be removed by the chemical etching treatment and, then, the surface of the glass workpiece is subjected to a precision polishing.

Hata's Polishing Only Corresponds to Claimed Preparing Step

When viewing the precision polishing of Hata et al in the context of an overall process, it corresponds only to the precision polishing in the preparing step, as now added to amended claims 1 and 2. More specifically, in Hata et al, [1] the etching treatment is carried out after the grinding process, and [2] the etching treatment is carried out under a condition that the surface subjected to the grinding process is etched by about 50 to 500 μm .

On the other hand, in amended claim 1 and 2, [1] the acid or the alkali treatment is carried out *after* the precision polishing, and [2] the acid or the alkali treatment is expressly carried out under a condition that the machining scraps, the reaction product, and the machining-affected layer are removed while maintaining the flatness and a surface roughness of the glass substrate.

It is apparent from the foregoing comments that the etching treatment of Hata et al cannot correspond to the acid or alkali treatment described in the amended claim 1 or 2.

Hata Fails to Teach Sequence of Five Key Steps

In sum, Hata et al does not disclose the sequence of two or more of the preparing step, the profile measuring step, the flatness control step, the acid treatment step or the alkali treatment step, and the polishing step, as described in amended claim 1 or 2.

Hata Cannot Be Combined with Takeuchi et al

As previously noted, the Examiner has focused on the etching step of Takeuchi et al and has suggested that Hata et al may be combined with the teachings of Takeuchi et al. However, this combination is not practically feasible or technically sound, given the teachings in the references.

As mentioned above, the precision polishing of Hata et al corresponds to the precision polishing in the first claimed step, i.e., preparing step, as expressly set forth in amended claim 1 or 2. Therefore, even if the idea of Hata et al is combined with the idea of Takeuchi et al, no more than a structure is given in which, after the grinding process, the etching treatment, and the precision polishing of Hata et al are sequentially carried out, measurement of the height of peaks and valleys on the substrate surface, plasma etching, and a very short time of polishing of Takeuchi et al are sequentially carried out. The structure described in the amended claim 1 or 2 is never suggested or feasible, even if the idea of Hata et al is combined with the idea of Takeuchi et al.

Furthermore, the etching treatment of Hata et al must be carried out so that the surface subjected to the grinding process is etched by about 50 to 500 μm in order to remove the process deformed layer occurred in the grinding process. It is therefore impossible to apply an etching treatment of Hata et al, such that the surface is etched by about 50 to 500 μm , as an etching process, if the etching process of a substrate surface may be carried out after the substrate surface is leveled by the plasma etching of Takeuchi et al.

Given the disparate teachings of the three cited references, the lack of any teaching of the overall claimed process in any prior art reference, and the different purposes and results of the individual steps that the Examiner extracts from each reference, Applicants respectfully submit that the processes, as defined by the expressly recited steps in the sequence set forth in claims 1 and 2, are patentable.

Claims 4, 5, 7-10 and 12-21

These claims depend from allowable claims 1 or 2. Thus, these remaining claims are also patentable because of that dependency and for the reasons given for patentable claims 1 and 2.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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